

The Optimum Operating Conditions for the Synthesis of Zeolite from Waste Incineration Fly Ash by Alkali Fusion and Hydrothermal Methods

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Abstract : The fly ash of waste incineration processes is usually hazardous and the disposal or reuse of waste incineration fly ash is difficult. In this study, the waste incineration fly ash was converted to useful zeolites by the alkali fusion and hydrothermal synthesis method. The influence of different operating conditions (the ratio of Si/Al, the ratio of hydrolysis liquid to solid, and hydrothermal time) was investigated to seek the optimum operating conditions for the synthesis of zeolite from waste incineration fly ash. The results showed that concentrations of heavy metals in the leachate of Toxicity Characteristic Leaching Procedure (TCLP) were all lower than the regulatory limits except lead. The optimum operating conditions for the synthesis of zeolite from waste incineration fly ash by the alkali fusion and hydrothermal synthesis method were Si/Al=40, NaOH/ash=1.5, alkali fusion at 400 °C for 40 min, hydrolysis with Liquid to Solid ratio (L/S)= 200 at 105 °C for 24 h, and hydrothermal synthesis at 105 °C for 24 h. The specific surface area of fly ash could be significantly increased from 8.59 m²/g to 651.51 m²/g (synthesized zeolite). The influence of different operating conditions on the synthesis of zeolite from waste incineration fly ash followed the sequence of Si/Al ratio > hydrothermal time > hydrolysis L/S ratio. The synthesized zeolites can be reused as good adsorbents to control the air or wastewater pollutants. The purpose of fly ash detoxification, reduction and waste recycling/reuse is achieved successfully.

Keywords : alkali fusion, hydrothermal, fly ash, zeolite

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